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## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

|  |   |  |
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| Applicant's or agent's file reference<br>DAS/P/76056.WO/B                                      | <b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) |  |
| International application No.<br>PCT/IB 03/04631   | International filing date (day/month/year)<br>21.10.2003 ✓  | Priority date (day/month/year)<br>23.10.2002 ✓ |
| International Patent Classification (IPC) or both national classification and IPC<br>H04N5/335 |   |  |
| Applicant<br>MELEXIS NV ✓  |   |  |

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 5 sheets, including this cover sheet. ✓

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 5 sheets. ✓

3. This report contains indications relating to the following items:

- I ☒ Basis of the opinion
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

|   |   |
|---|---|
| Date of submission of the demand<br>20.05.2004 ✓  | Date of completion of this report<br>09.03.2005   |
| Name and mailing address of the international preliminary examining authority:<br> European Patent Office<br>D-80298 Munich<br>Tel. +49 89 2399 - 0 Tx: 523656 epmu d<br>Fax: +49 89 2399 - 4465 | Authorized Officer<br>Montanari, M<br>Telephone No. +49.89 2399-2602<br> |

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/IB 03/04631

**I. Basis of the report**

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

**Description, Pages**

1-7 as originally filed

**Claims, Numbers**

1-30 received on 23.11.2004 with letter of 23.11.2004

**Drawings, Sheets**

1/3-3/3 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).  
☐ the language of publication of the international application (under Rule 48.3(b)).  
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.  
☐ filed together with the international application in computer readable form.  
☐ furnished subsequently to this Authority in written form.  
☐ furnished subsequently to this Authority in computer readable form.  
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.  
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:  
☐ the claims, Nos.:  
☐ the drawings, sheets:

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EXAMINATION REPORT**

International application No. **PCT/IB 03/04631**

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5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

|                               |             |      |
|-------------------------------|-------------|------|
| Novelty (N)                   | Yes: Claims | 1-30 |
|                               | No: Claims  |      |
| Inventive step (IS)           | Yes: Claims | 1-30 |
|                               | No: Claims  |      |
| Industrial applicability (IA) | Yes: Claims | 1-30 |
|                               | No: Claims  |      |

**2. Citations and explanations**

**see separate sheet**

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EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/IB 03/04631

1. Reference is made to the following documents:

D1: US-A-4 612 581 (HARADA NOZOMU ET AL) 16 September 1986 (1986-09-16)

D2: PATENT ABSTRACTS OF JAPAN vol. 2000, no. 05, 14 September 2000 (2000-09-14) & JP 2000 050304 A (AIPHONE CO LTD), 18 February 2000 (2000-02-18)

2. All independent claims on file meet the requirements of Article 33(2) PCT because their subject-matter is not disclosed by any document cited in the International Search Report.

Further, the claimed features are also not suggested in combination by any of the cited documents, nor the combination of such features can be regarded as obvious to the skilled person. Therefore all independent claims on file meet the requirements of Article 33(3) too.

In particular, as to the subject-matter of claim 1, this claim concerns a method of transferring signals from a plurality of sensing elements integrated in a first IC to a processing means provided on a second integrated circuit.

In a normal image sensor like a CCD, the output signal is an amplitude modulated clock comprising the sequential sampling of the sensing elements. This signal is then normally transmitted to a further circuit like a CDS (correlated double sampling) circuit which demodulates the output signal and passes the demodulated signal to a further processing means.

However, it is not known nor suggested by the available prior art that different groups of sensing elements are simultaneously sampled and used to modulate different carriers simultaneously transmitted to the second integrated circuit.

D1 and D2 disclose systems wherein amplitude modulation is carried out by means of external components (reference is made to the passages cited in the search report).

3. Claim 1 and independent claim 13 correspond to each other, claim 13 relating to a device for carrying out the method of claim 1. Thus the above findings apply to claim 13 as well, *mutatis mutandis*.
4. As to the dependent claims, their subject-matter better specifies features of claims

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EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/IB 03/04631

- 1 and 13 on which the claims depend. Thus they relate to the general subject-matter of the application as a whole, matter considered to be novel and inventive.
5. All claims fulfil the requirements of Article 33(4) PCT since the device concerned can be applied in the field of electronic imaging.
  6. Reference signs in parentheses are not inserted in the claims to increase their intelligibility, Rule 6.2(b) PCT.
  7. Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D1 and D2 is not mentioned in the description, nor are these documents identified therein.
  8. The description is not in conformity with the claims on file.

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CLAIMS

1. A method of transferring signals from a plurality of individual sensing elements provided on a first integrated circuit to a processing means provided on a second integrated circuit comprising the steps of sequentially sampling the output of a number of sensing elements in a predetermined sequence to create a first signal, modulating the amplitude of a constant frequency signal to create a second signal, transmitting said second signal from said first integrated circuit to said second integrated circuit, demodulating said second signal to regenerate said first signal and passing said regenerated first signal to said processing means wherein the outputs of a first group of individual sensing elements are sampled and are then used to modulate a carrier signal of constant known frequency and, the output of a second group of individual sensing elements is simultaneously sampled and used to modulate a carrier signal of a different constant known frequency, both modulated signals being simultaneously transmitted to said second integrated circuit and simultaneously demodulated after arriving at said second integrated circuit.
2. A method according to Claim 1 wherein outputs of several such groups of individual sensing elements are simultaneously sampled, modulated, transmitted and demodulated.
3. A method according to Claim 2 wherein the groups of sensing elements correspond to individual rows or columns in a sensing array, the sampling sequence within the group starting with a sensor at one end of the said row or column and finishing with the sensor at the opposite end of said row or column.
4. A method according to Claim 3 wherein each row or column is provided with dedicated modulating means and the modulated signals are subsequently combined by a suitable combining means.
5. A method according to any preceding claim wherein the sampling process is repeated instantly.

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6. A method according to any preceding Claim wherein there is a predetermined delay between the successive sampling sequences.
7. A method according to any preceding claim wherein said second signal undergoes analogue to digital conversion and is subsequently demodulated as a digital process.
8. A method according to Claim 7 wherein signals resulting from a digital demodulation process are stored in registers for further image processing.
9. A method according to any one of Claims 3 to 8 wherein each carrier signal for each row or column or group of the individual sensing elements has a different frequency.
10. A method according to Claim 9 wherein carrier frequencies are determined such that any odd harmonics that may be generated during the modulation process using one carrier frequency are at frequencies that do not fall close to other carrier frequencies.
11. A method according to Claim 10 wherein carrier frequencies are produced by integer division from a single clock frequency signal.
12. A method according to Claim 11 wherein a suitable clock frequency is 1 Megahertz and a suitable integer division ratios are one of 18, 20, 22, 25, 28, 33, 40 and 50.
13. A sensing device comprising an array of individual sensing elements provided on a first integrated circuit and processing means for the output of said array of said sensing elements provided on a second integrated circuit, said circuits being linked by a single conducting connection, said first integrated circuit comprising in addition to said sensing elements, sampling means for sequentially sampling the output of said sensing elements in a predetermined order to generate a first signal, signal generator means for generating a carrier signal of a constant known frequency, modulation means for modulating said carrier signal with said first signal to generate a second

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signal, and transmission means for transmitting said second signal to the second integrated circuit, said second integrated circuit incorporating means for receiving said second signal, means for demodulating said second signal to regenerate said first signal and means for processing said regenerated first signal wherein the outputs of a first group of individual sensing elements are sampled and are then used to modulate a carrier signal of constant known frequency and, the output of a second group of individual sensing elements is simultaneously sampled and used to modulate a carrier signal of a different constant known frequency, both modulated signals being simultaneously transmitted to said second integrated circuit and simultaneously demodulated after arriving at said second integrated circuit.

14. A sensing device according to Claim 13 Wherein outputs of several such groups of individual sensing elements are simultaneously sampled, modulated, transmitted and demodulated.

15. A sensing device according to Claim 14 wherein the groups of sensing elements correspond to individual rows or columns in the sensing array, the sampling sequence within the group starting with the sensor at one end of the said row or column and finishing with the sensor at the opposite end of said row or column.

20 16. A sensing device according to Claim 15 wherein each row or column is provided with dedicated modulating means and the modulated signals are subsequently combined by a suitable combining means.

17. A sensing device according to any one of Claims 13 to 16 wherein the sampling process is repeated instantly.

25 18. A sensing device according to any one of Claims 13 to 16 wherein there is a predetermined delay between the successive sampling sequences.

19. A sensing device according to any one of Claims 15 to 18 wherein each sensing element in a row or column is connected to a row or column output conductor by a switch.

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20. A sensing device according to any one of Claims 13 to 19 wherein sequential sampling of the outputs of individual sensing elements is carried out by sequentially connecting each sensing element to the row or column output conductor by closing each switch in turn.
- 5 21. A sensing device according to Claim 19 or Claim 20 in which each sensor generates a differential output, each said sensing element being connected by a pair of switches to a pair of output conductors, these switches being closed in turn.
22. A sensing device according to any one of Claims 13 to 21 wherein said  
10 second signal undergoes analogue to digital conversion and is subsequently demodulated as a digital process.
23. A sensing device according to Claim 22 wherein signals resulting from a digital demodulation process are stored in registers for further image processing.
- 15 24. A sensing device according to Claim 22 or Claim 23 in which digital processing is carried out by a microprocessor.
25. A sensing device according to any one of Claims 15 to 24 wherein each carrier signal for each row or column or group of the individual sensing elements has a different frequency.
- 20 26. A sensing device according to Claim 25 wherein carrier frequencies are determined such that any odd harmonics that may be generated during the modulation process using one carrier frequency are at frequencies that do not fall close to other carrier frequencies.
27. A sensing device according to Claim 27 wherein carrier frequencies are  
25 produced by integer division from a single clock frequency signal.
28. A sensing device according to Claim 27 wherein a suitable clock frequency is 1 Megahertz and a suitable integer division ratios are one of 18, 20, 22, 25, 28, 33, 40 and 50.

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29. A sensing device according to any one of claims 24 to 29 wherein a signal clock signal generator or synchronisation signal generator is connected to both integrated circuits.

30. A sensing device according to any preceding claim in which said  
5 sensing elements are IR (infrared) sensing elements.

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